JRG College of Pharmacy

JRG COLLEGE OF PHARMACY

UNIVERSITY SOLVED QUESTION WITH ANSWER

Year : 2023-2024

Subject : Ph. Inorganic Chemistry

Subject Code : BP104T

Subject In-Charge : Ms.Kiranmayee Bhatra & Mr.Jyoti prasanna Nanda

Registration No:

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Course: B Pharm
SUB_CODE: 23PBP104

1st Semester (Regular) Examination: 2023-24

SUBJECT NAME: : Pharmaceutical Inorganic Chemistry
BRANCH: Pharmacy
Max Time: 3 Hours
Max Marks: 75

Sitting: 1st 10.00 AM to 1.00 PM
Q Code A 024

Medium of Writing: English
The figures in the right-hand margin indicate marks.

Part- A

Q 1 Objective Type (Answer All) (10 x 2 Marks)

a) The chemical formula of Calamine is
   a. ZnO
   b. ZnS
   c. $ZnCO_3$
   d. $Zn(OH)_2$

b) Inorganic compounds generally do not Contain..... atoms
   a. Nitrogen
   b. Carbon
   c. Oxygen
   d. Sulphur

c) According to Arrhenius concept an acid is substance which
   a. Gives H^+ ion
   b. Gives OH^- ion
   c. Donate a proton
   d. Turns red litmus blue

d) Buffers are mixture of
   a. Strong acid & Strong base
   b. Weak base & Weak acid
   c. Weak acid & salt of weak acid
   d. None of above

e) Antidotes act by
   a. neutralizing the poison
   b. mechanical antidote
   c. physiological antidote
   d. none of these

f) Green vitriol is the synonym of
   a. Zinc Sulphate
   b. Ferrous Sulphate
   c. Copper Sulphate
   d. Potassium permanganate

g) The agents which act by increasing the osmotic load of intestine
   a. Lubricants
   b. Bulk purgatives
   c. Saline cathartics
   d. Stimulant

PTO

h) Thioglycolic acid is used in a limit test of iron because
   a. It provides an acidic medium
   b. It reduces ferric iron to ferrous iron
   c. It gives purple coloured complex with iron
   d. B & C

i) What is pH a measure of?
   a. Density
   b. ion concentration
   c. hydrogen-ion concentration
   d. solute concentration

j) Limit test for arsenic is based on which test?
   a. Gutzeit test
   b. Fehling's test
   c. Benedict's test.
   d. All of the above

Q 2 Short Answer Questions (Answer any Seven out of Nine) (7 x 05 Marks)

a) Write the principle involved in the limit test for arsenic.
b) What are antimicrobials? Write a note on various iodine preparations.
c) Write a note on Pharmacopoeia of India.
d) What is electrolyte combination therapy? Explain a note on ORS.
e) What are dentifrices? Classify them with an example
f) What are saline cathartics? What is their mechanism of action?
g) Why sulphuric acid is added in the assay of Hydrogen peroxide.
h) What are Haematinics? Explain the preparation and assay Of Green Vitriol.
i) Describe the precautions for storage and handling of radioisotopes.

Part – B (Answer Any Two)

Long Answer Question

Q 3 What are impurities? Explain different sources of impurities present in pharmaceutical substances. (1 X 10 Marks)

Q 4 What are Antacids? Classify them with examples. Give the ideal properties of Antacids. Write the preparation, assay and uses of sodium bicarbonate. (1 X 10 Marks)

Q 5 Describe buffer capacity, stability of buffers and methods of adjusting isotonicity. Briefly discuss the role of buffers in pharmacy. (1 X 10 Marks)

Q.1] — PART- A :—

a) The chemical formula of calamine is $ZnCO_3$.

b) In-organic compounds generally do not contain carbon atom.

c) According to Arrhenius concept an acid is substance which give H^+ ion.

d) Buffers are mixture of weak acid and salt of weak acid.

e) Antacid act by neutralizing the poison.

f) Green vitriol is the synonyms of $FeSO_4 \cdot 7H_2O$.

g) The agents which act by increasing the osmotic load of intenstine is saline cathartics.

h) Thioglycolic acid is used in a limit test for iron because it reduces ferric iron to ferrous iron and it gives purple coloured complex with iron.

i) what is pH a measure of?
ans- Hydrogen ion. concentration

j) Limit test for arsenic is based on Gutzeit test

2//

a// Limit test of Arsenic is based on the reaction of Arsenic gas with hydrogen ion to form Yellow stain on mercuric chloride paper in the presence potassium iodide.

↳ It is also called as Gutzeit test and required special apparatus.

↳ Arsenic, present as arsenic acid in the sample is reduced to arsenious acid by reducing agent like KI, H_2SnO_2, Zn, HCl etc. Arsenious acid is further reduced to arsine gas by hydrogen and reacts with mercuric chloride paper to give yellow stain.

REACTION:-

(As) Arsenic + H_2SO_4 ⟶ H_3ASO_3 (Arseneous acid) + H_3ASO_4

H_3ASO_4 (Arsenic acid) + H_2SnO_2 (Stanous acid) ⟶ H_3ASO_3 (Arseneous acid) + H_2SnO_3

$H_3ASO_3 + 3H_2$ ⟶ ASH_3 (Arseni gas) + $3H_2O$

$2ASH_3 + HgCl_2$ (Mercuric chloride) $\xrightarrow{KI}$ $Hg(ASH_2)_2$ (Yellow stain) + 2HCl

The depth of yellow stain on mercuric chloride paper will depend upon the quality of arsenic present in Sample

b// Antimicrobial agent:-

↳ These are those chemical compound or drug that inhibit or destroys the growth of microorganism.

↳ They can either kill or destroys the growth of bacteria.

Iodine:-

Chemical formula:- I_2

Molecular weight:- 253.8 g/mol

Synonym:- Halogen

Preparation:-

In laboratory, It is prepared by heating the mixture of KI, MnO_2 and conc. H_2SO_4

$$2KI + MnO_2 + 3\ \text{conc.}\ H_2SO_4 \longrightarrow I_2 + 2KHSO_4 + MnSO_4 + 2H_2O$$

Property:-

- It occurs as greyish violet or bluish-black crystal.
- It has strong harsh odour.
- It is volatile in nature.
- It is soluble in water.
- It is soluble in alcohol.

USES:-

- It is used as antimicrobial agent.
- It is used as iodine deficiency
- It is used in thyroid cancer.

Indian Pharmacopoiea :-

- Indian Pharmacopoiea is an official book of standard for the drug to defined identity, purity and strength of the drug that are manufactured, import and distributed in india.
- Indian Pharmacopoiea is maintained by IPC (Indian Pharmacopoiea Commision.
- It's head office is in Ghaziabad (UP).
- Indian Pharmacopoiea is published by 'NISCAIR'. (National institute of science Communication and information resources) located in New delhi.
- Pharmacopoiea is nothing but the collection of detail information on a particular drug (Its dosage form and methode of analysis).

History of indian Pharmacopoiea :-

- In Pre independence days B.P. was used in india.
- In 1946. Govt of india issue the indian pharmacopoiea List Committe under the chairman of late K.N. Chopra.
- In 1948 Govt of india appointed an indian Pharmacopoiea Committe to prepare indian Pharmacopoiea
- 1st eddition of ~~committe~~ Pharmacopoiea is appeared in 1955 with 2 volume and 986 monograph
- 2nd eddition of I.P is appeared in 1966 with addendum 1975 and 890 monograph.

d) Replacement therapy:-

- In different abnormal conditions like diarrhoea, vomiting, dehydration electrolyte in our body get in balance
- The main purpose of electrolyte replacement therapy is to overcome the electrolyte imbalance and restore the composition of body fluid and body ~~balance~~ volume.
- These following three compounds which are used as the major source of electrolyte.
  1. Sodium chloride 2. KCl 3. calcium Gluconate.

ORS:-

- The full form of ORS is oral rehydration Salt.
- It is a type of fluid replacement used mainly in treatment of dehydration occurs due to diarrhoea.
- ORS is the cheap, simple and effective way to treated dehydration caused by diarrhoea.
- ORS drink contain the main element that are lost from our body during Diarrhoea.

FORMULA FOR ORS:-

The formula of ORS is recomended by WHO and UNICEF.

- 2.6 g/l Sodium chloride
- 2.9 g/l trisodium citrate dehydrate
- 1.5 g/l Potassium chloride
- 13.5 g/l glucose
- Q.S upto 1000 ml, Total weight = 20.5 gm

e/l Dentrifrices:-

↳ Dentrifrices are the product that are used for cleaning of teeth and adjacent gum.

↳ It can be used with finger or tooth brush.

↳ It is available as paste as well as powders.

↳ The cleaning action of dentrifrices depends upon abrasive property and rubbing force used.

Properties of dentrifrices:-

↳ Dentrifrices are responsible for physical removal of plaque.

↳ A good dentrifrices must remove stains from teeth and provide freshness to mouth.

DRAW BACKS:-

↳ Dentrifrices are not be able to clean surface inside cavities.

e.g:- Calcium gluconate:-

chemical formula:- $CaCO_3$

molecular weight:- 100.09 gm/mol

synonyms:- Precipited chalk.

Preparation:-

$$CaCl_2 + Na_2CO_3 \longrightarrow CaCO_3 + 2NaCl$$

(calcium chloride) (sod. carbonate) (calcium gluconate)

Properties:-

↳ It occurs as white crystaline powder, odour less and taste less.

↳ USES:- It is used as dentrifrices and polishing agent.

↳ It is used as antacid and insecticide.

1// CATHARTICS:-

↳ cathartics are the drug that are used to get relief from constipation.

↳ Cathartics mainly increases the mobility of intestine

Saline cathartics:-

↳ These are the drug which increases the osmotic load of GIT

↳ consumed with large amount of water.

↳ ON the basis of mechanism it classified as follows

1. Stimulant Cathartics
2. Lubricant Cathartics
3. Bulk forming Cathartics
4. Saline Cathartics.

Mechanism of action of Saline Cathartics:-

↳ These Cathartics work by drawing water into the intestines through osmosis. increasing stool volume and stimulating bowl movement to faciliate evacuation.

a// osmotic effect:-

↳ saline Cathartics Contain salt such as Na_2SO_4, $MgSO_4$ which draw water into intestine through osmosis, increasing the amount of water in stool. so that it easier to pass.

b// Increasing intestinal secretion:-

↳ saline cathartics stimulate the intestinal mucosa to secrete more water and electrolytes.

↳ This increases the amount of fluid in intestine

c// stimulation of intestinal motility.

d// Reduced water absorption.

III Hydrogen Peroxide:-

Chemical formula:- H_2O_2

Molecular Weight:- 34.1 g/mol

Synonyms:- Hydrogen oxide, peroxide

Preparation:-

It can be prepared by the reaction of Sodium Peroxide with dil. H_2SO_4.

$$Na_2O_2 + H_2SO_4 \longrightarrow H_2O_2 + Na_2SO_4$$

(Sod. Peroxide)

↳ Sulphuric acid is added in assay of hydrogen Peroxide to create an acidic enviroment, which is crucial for oxidation reaction with $KMnO_4$ and to provide Protons (H^+) that are consumed during redox reaction.

↳ The reaction between H_2O_2 and $KMnO_4$ is a redox reaction that proceeds efficiently in acidic medium. H_2SO_4 provides the ~~nesse~~ necessary acidic condition for the reaction to occur and also ensures that the reaction proceeds smoothly and stoichiometrically.

↳ Sulphuric acid also helps to statisfy the stoichiometric requirements of the redox reaction by providing necessary H^+ ~~that~~ are consumed during the ~~redox~~ oxidation of H_2O_2.

Reaction:-

$$2KMnO_4 + 5H_2O_2 + 4H_2SO_4 \longrightarrow$$

$$2KHSO_4 + 2MnSO_4 + 8H_2O + 5O_2$$

h// HAEMATINICS :-

↳ Haematinics are the substance that are required in the formation of blood and mainly used in the treatment of anemia.

↳ These drugs increases the no. of RBCs and amount of haemoglobin when they are below the normal level.

↳ Anaemia occurs when the balance between production and destruction of RBCs get distrubed.

Ferrous sulphate :-

M.F = $FeSO_4 \cdot 7H_2O$. M.W = 278 g/mol. Synonyms = Green vitrol

Preparation :-

$$Fe + H_2SO_4 \longrightarrow FeSO_4 + H_2$$

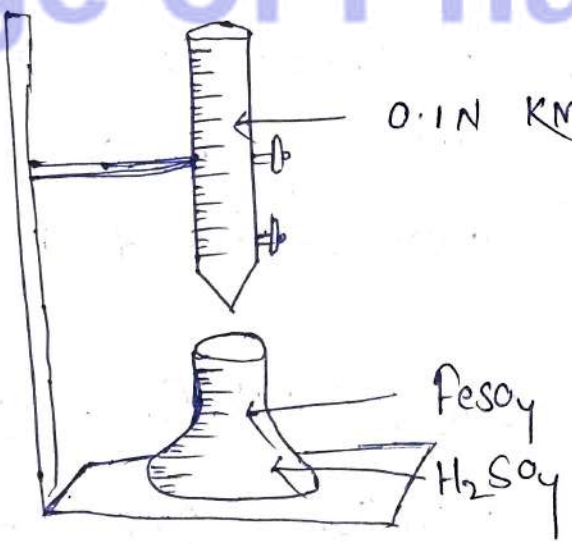
ASSAY :-

↳ Assay of Ferrous Sulphate is performed using a redox titration.

↳ Add About 0.76 gm of $FeSO_4$ in 100 ml of water.

↳ Add 0.1 ml of 3 drop H_2SO_4 as indicator

↳ Titrate with 0.1 N $KMnO_4$ Standard Solution until Purple Colour appears.



Radioactivity:-

- The phenomenon of spontaneous emmision of certain kind of radiation from a unstable nuclei to get stable, is known as Radio activity.

STORAGE CONDITION and precaution of Radio active substance

- It should be handeled with forceps and direct contact should be avoid.
- Any substances which is taken internaly (food, drink) should not be carried out in labs where radioactive materials are used.
- must wears protecting cloths, sheilds, while handeling their materials.
- It should be labelled in containers with sheilding.
- storage should be maintained properly.
- Disposed should be done with great care
- Area where radioactive materials are used should be monitered.
- Care should be comply with national regulation for protection against concizing radiation.

:PART-B:-

3. IMPURITY:-

↳ Impurity is any material that affect the Purity of material of interest.

↳ Presence of impurity may produced toxic effect.

↳ It may lower the strength of pharmaceutical substance

↳ Common impurities include Lead, Arsenic, iron, chloride etc.

SOURCE of impurity:-

1. Raw materials:-

↳ impurities from raw material may be carried out through manufacturing process and contamine the final product.

Eg:- Rock salt (Caso4 + MgCl2) = NaCl

Rock salt Contain small amount of Calcium Sulphate and magnessium chloride, Now 'NaCl' Prepared from this sorce may Contain calcium and magnessium traces.

2 Reagent used:-

↳ If the reagent used in manufacturing are not Completely removed by washing, Then it entry to the final product.

Eg:- $HgCl_2 + 2NH_4OH \longrightarrow NH_2HgCl + NH_4Cl$

↳ In above reaction ammoniated chloride Prepared Contain ammonium hydroxide. Now if it is not removed by washing with water then it may contaminated the final Product.

Methods / Process:-

↳ There are various methode / Process used for manufacturing of Pharmaceutical Products. In Certain days, a multiple step synthesis Process is used, which Produce intermediate Compound.

↳ It should not ...

↳ Now it is very important to purify this intermediate compound otherwise it will contamined the final product.

Solvent:-

↳ most of the Pharmaceutical Product manufactured using water as solvent. Now generally we used distilled water or de-mineralized water, but Sometime for reducing cost we use softened water that contain 'Na+' and 'Cl-' ion as impurity that Contamined the final Product.

ATMOSPHERIC CONTAMINATION:-

↳ In industrial area atmosphere is contamined with dust particle and harmfull gas, during manufacturing products can react with them and get Contaminated.

E.g:- NaOH reacts with atmospheric CO_2 and get contaminated that's why it should not be kept open for long time.

Packaging errors:-

↳ Products of similiar appearance such as tablet of same shape, size and colour. Sometimes packed in similiar Containers lead to potential ~~error~~ source of dangers.

↳ Improper lebelling may also Cause major Packaging errors.

STORAGE Condition:-

After Preparation of final Product it should be stored in appropiate containers depending upon :-

- Natural of material
- Batch size
- Quantity.

ANTACIDS:-

- Antacids are drugs that are used to decreases the level of gastric acid in stomach.
- They are used in case of hyper acidity.
- They are also prevent from Heart burn and ulcers.
- Antacids are generally weak base that reacts with excessive acid in stomach and Convert them into salt.
- They work by increasing gastric pH.

E.g:- $CaCO_3$, $NaHCO_3$

Classification of antacid:-

- It is of two types

A. Systemic antacid

B. Non-systemic antacid

A. systemic ~~circulation~~ ANTACID:-

- Antacid which absorbs in systemic circulation (Blood), are called as systemic circulation.
- They are not very suitable as they Cause metabolic alkalosis.

E.g:-

B. NON-systemic antacid:-

- Antacid which are not absorved into systemic circulation and do not affect acid base balance of the body Called as non systemic antacid.

E.g:-

IDEAL PROPERTIES:-

- It should be insoluble in water and has fine particle form.
- It should not Cause metabolic alkalosis.
- It must have its side effect over a long Period of time.
- It should not Cause Constipation

- It should not cause any side effect and too expensive.
- It should be stable and readily available.

Sodium Bi-Carbonate:-

C.F = $NaHCO_3$, M.W = 84.01 gm, Synonyms:- Baking Soda

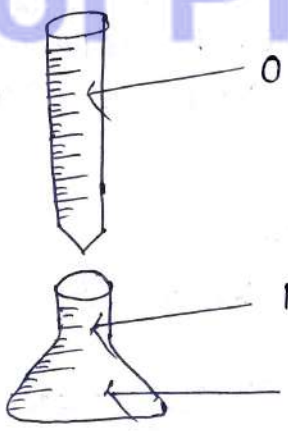
Preparation:- It can be Prepared by Solvay ammonia Process:

$$Na_2CO_3 + CO_2 + H_2O \longrightarrow 2NaHCO_3.$$

Property:-
- It is a white Crystaline powder.
- It is insoluble in ethanol but soluble in methanol and water.
- It having saline taste.
- It is alkaline in nature.

USES:- It is used as antacid.
- It used as electrolyte replensher.
- It is also used as disinfectant.

ASSAY:-
- The assay of $NaHCO_3$ is based on acid-base titration
- Add about 4.2 gm of $NaHCO_3$ in 1000 ml of water
- Add 2-3 drop of methyl red as an indicator
- Titrated with 0.1N HCl standard solution until Pink colour appears.



5. Buffer capacity:-

- The amount of acid / base required to produce an unit change in pH of a buffer solution is known as buffer capacity.
- It is also known as 'Buffer index'.

$$B = \frac{\Delta A \text{ or } \Delta B}{\Delta pH}$$

where, B = Buffer capacity
ΔA / ΔB = amount of acid / base added
ΔpH = Change in pH

STABILITY:-

- Buffer stability refers to buffer solution's ability to maintain a target pH over time.
- Buffer stability influenced by factors like storage conditions, pH and the presence of other substance.

Methode Adjusting TONICITY:-

- It basically includes 2 classes.
  - Case - I (For Hypertonic)
  - Case - II (For Hypertonic)

CASE-I:-

- This methode is basically used to adjusting Hypertonic solution. In this we basically add NaCl to make solution isotonic.
- It include:-

a) Cryoscopic / Freezing point depression methode.
b) Sodium Chloride equivalant methode.

a) Cryoscopic Methode:-

$$w\% = \frac{0.52 - a}{b}$$

where, w = amount of adjusting tonicity.
a = Freezing point of 1% solution of un-adjusting solution.
b = Freezing point of 1% solution of adjusting substance

b// Sodium Chloride methode:- E = Sodium chloride equivalent

$$E = \frac{17 \times Liso}{M}$$

Liso = Liso value

M = Molecular weight of drug soln

Case II :-

This methode is basically used to adjust the tonicity of hypertonic solution. In this methode we basically add the water to make the solution isotonic.

This include :-

a// White - vincent methode

$$V = W \cdot E \times 111.1$$

where, E = Sodium chloride equivalent

W = weight of drug in (gm)

V = volume of isotonic soln prepared by drug and water (ml)

b// sprowl methode :-

This is basically the simplification of white-vincent methode. In this we set the value of $W = 0.3$

$$V = 0.3\ E \times 111.1 \quad \text{or} \quad V = 33.33E$$

APPLICATION of BUFFER :-

- Enzyme activity depends on pH, so the pH during enzyme assay must be stay constant.
- most of the biological process occurs within a relativity small pH range and for that body have it's own buffer system which maintains a constant pH.
- Buffer solution also used to calibrate pH meters.
- Buffers are often used in food ~~indy~~ Industry to maintain the appropriate acidity / basisity of food.